



Newsletter

Volume 10, Number 5
September - October 1993

Director's Note

Ten years ago we began an experiment. With funds from the Mary Flagler Cary Charitable Trust and administrative freedom from The New York Botanical Garden, I assembled a team of remarkable scientists and support staff to build a small ecological institute of excellence. This experiment has gotten off to a superb start and the Institute of Ecosystem Studies has had many extraordinary successes.

As the Earth's environmental systems increasingly are assaulted at all levels, it is vital that this experiment succeed. Ecological understanding and education offer tangible hope for addressing multifaceted and potentially devastating environmental problems. Unraveling ecological complexity and communicating the results to decision makers in a useful way are monumental tasks. Now, facing the future as a separate and independent corporate institution, we at IES are excited by our unique opportunities to address these challenges.

The IES Newsletter is published by the Institute of Ecosystem Studies, Millbrook, New York. All newsletter correspondence should be addressed to the editor.

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Ten Years for IES, and a New Beginning

This is a proud and important time for the Institute of Ecosystem Studies. First, it is the Institute's anniversary. Founded exactly 10 years ago as a division of The New York Botanical Garden, IES is celebrating a decade during which it has gained international recognition for its research and education programs in ecology and the analysis of ecosystems.

A second milestone is the Institute's new independent status. Three years after the death of Mary Flagler Cary, the trustees of the charitable trust created under her will deeded her property to The New York Botanical Garden. The Mary Flagler Cary Arboretum evolved subsequently as a distinct program 75 miles distant from the Garden's Bronx headquarters. Financially independent of the Garden from the outset, the program gained new impetus with the appointment of Dr. Gene E. Likens in 1983 to found the Institute of Ecosystem Studies. The latest move to full independence simply affirms the strength and maturity of this leading center of research and education in ecology.

While the new corporation was formed in February 1993 and non-profit status granted by the Internal Revenue Service in July, November 1 officially marked the Institute's new beginning. The first meeting of the new IES board of trustees was held in mid-October. The Institute's facilities, staff, research and education programs and day-to-day activities are not changing with independence.

Dr. Likens is president of the new corporation while retaining the title of IES director. The Institute's board is chaired by Gretchen Long Glickman. Millbrook resident Oakleigh B. Thorne, who previously

chaired the committee of The New York Botanical Garden that oversaw the program of the Institute, is vice-chairman.

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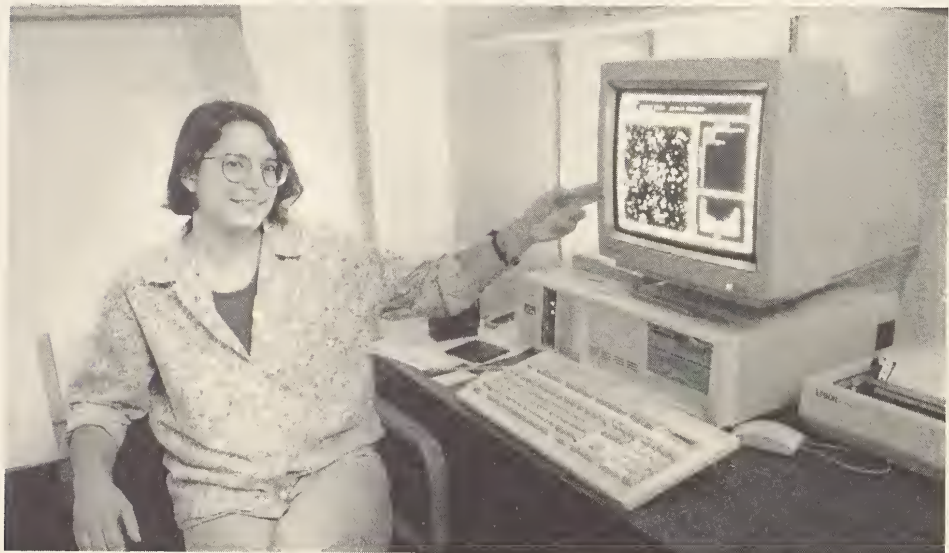


Ms. Gretchen Long Glickman, chairman, and Dr. Gene E. Likens, president, review material prior to the first meeting of the IES board of trustees.

Summer 1993 at the Institute of Ecosystem Studies: Selected Highlights

Cary Summer Fellowships

The Cary Summer Fellowship is an annual award enabling one or more scientists to do research at the Institute. Funds for the award are provided by the Mary Flagler Cary Charitable Trust and provide Cary Fellows with the opportunity to pursue intensive studies, free from academic responsibilities. The scientists' work contributes to and strengthens their ongoing teaching and/or research programs at their home institutions. During summer 1993, Cary Summer Fellowships were awarded to Dr. Marie-Josée Fortin and Dr. Erik Kiviat.



Modeling forest change

Cary Summer Fellow Dr. Marie-Josée Fortin spent two months collaborating with IES plant ecologist Dr. Charles Canham on his studies of forest dynamics. A post-doctoral scientist at the Centre D'Études Nordiques, Université Laval, Quebec, Dr. Fortin is a statistical ecologist whose focus is on spatial statistics and landscape ecology.

At Université Laval, Dr. Fortin is doing the statistical analyses for two major studies. Working with Dr. Serge Payette, she is investigating sugar maple decline by comparing tree ring width with long-term temperature and precipitation records at 16 sites in southern Quebec. Her second project deals with the dynamics of natural fires in the boreal forests and tundra in northern Quebec. She is developing a computer model that will relate historical data, obtained from analyzing fire scars and charcoal samples, to distribution of fire in this century. Her model will help scientists determine the key factors that lead to deforestation in the tundra.

As a Cary Fellow, Dr. Fortin used data from Dr. Canham's long-term study of a mixed hardwood forest in northwestern Connecticut to develop a computer model that adds a new dimension to the analysis of forest gaps. Gaps, which are openings in the forest canopy, allow increased amounts of light (one of the three main resources, with water and soil nitrogen, necessary for plant growth) to reach the forest floor. In this way they directly affect the development of seedlings and saplings. The computer model recently developed by Dr. Fortin takes into consideration the spatial variation of light levels within gaps and predicts the changes that will occur in and around gaps over time.

Above: Dr. Marie-Josée Fortin uses computer models to predict forest change.

An article describing research by Dr. Kiviat on Blanding's turtles and their habitats will appear in the next issue of the newsletter.

Research Experiences for Undergraduates Program

Fifty-four college undergraduates from across the United States have experienced the challenges and rewards of independent scientific research, thanks to the Research Experiences for Undergraduates (REU) program at the Institute of Ecosystem Studies. The Institute's REU program, funded by the National Science Foundation (NSF), has been in place since summer 1988, and each year the task of selecting the best-qualified students from among the many applicants has become more difficult.

Applications for this year's program began arriving in January, and at final count numbered over 150. Eight students were

chosen and arrived at the Institute at the end of May. Working with IES mentor scientists, they conceived and designed their investigations, did field and laboratory research and prepared their findings for presentation at a public symposium late in August. Along the way they learned about methods, applications and issues in science during weekly "Research Strategies" and "Research in Context" sessions led by Institute scientists and guest lecturers. During a mid-July "Forum on Opportunities in Ecology", REU students as well as students from local colleges and universities learned about the pros and cons of careers in science from 12 professionals representing research, academia, environmental activism, protection and management, law, industry, government and public education.

The 1993 REU students and their projects were:

- Joel E. Brown (SUNY College of Environmental Science and Forestry, N.Y.): *Comparative field studies between an invasive exotic plant species, Lythrum salicaria L. (purple loosestrife) and two native plant species, Solidago spp. (goldenrod) and Eupatorium spp. (boneset) in a mesic old field.* Dr. S.T.A. Pickett, mentor
- Susan Haddox (Gustavus Adolphus College, Minn.): *The effects of damage on shoot elongation in Populus deltoides (cottonwood).* Dr. C.G. Jones, mentor.
- Jennifer A. McMahon (Baldwin-Wallace College, Ohio): *The spatial variation in abundance and reproductive rates of Bosmina longirostris in the Hudson River.* Dr. M.L. Pace, mentor.
- Keith A. Perchemlides (Bard College, N.Y.): *Vegetational controls on nitrogen cycling in a Catskill Mountain watershed.* Drs. G.M. Lovett and K.C. Weathers, mentors.
- Hudson A. Roditi (SUNY New Paltz, N.Y.): *The effects of zebra mussels (Dreissena polymorpha) on phytoplankton in the Hudson River.* Dr. J.J. Cole, mentor.
- Jasper Steenhuis (Binghamton Univ., N.Y.): *Patterns of DOC composition and microbial assimilation in the hyporheic zone: enzyme analysis.* Dr. S.E.G. Findlay, mentor.
- David A. Steinberg (Cornell Univ., N.Y.): *The effects of earthworms on nitrogen mineralization along an urban-rural land use gradient.* Dr. R.A. Pouyat, mentor. [See following story]
- Carolyn P. Williams (Mississippi Valley State Univ., Miss.): *Patterns of DOC composition and microbial assimilation in the hyporheic zone: composition of dissolved organic carbon.* Dr. S.E.G. Findlay, mentor.

The students' findings will be published as an IES Miscellaneous Publication.

The NSF initiated the REU program in the 1980s to improve science education and to help assure an adequate supply of top-notch scientists, mathematicians and engineers for the future. Many institutions across the country compete for annual funding for this program, and IES is proud of its success in receiving REU grants for six consecutive years.

REU Study: Earthworms Make a Difference

REU student David Steinberg helped IES visiting scientist Dr. Richard Pouyat (U.S. Department of Agriculture Forest Service) explore a paradox. In the course of his work with the Institute's long-term urban-to-rural gradient ecosystem studies, Dr. Pouyat had discovered that while the soils in rural areas had higher quality leaf litter (more easily broken down by decomposer organisms) than did urban soils, the nitrogen mineralization* rates in urban soils were higher. Normally, in higher quality litter, organic matter is broken down more quickly and therefore nitrogen mineralization rates are correspondingly high. What could explain the disparity between leaf litter quality and nitrogen mineralization rates along the gradient? There may be several explanations, and Mr. Steinberg investigated one that may prove to be especially significant:

** Nitrogen mineralization is the process by which organic nitrogen from dead plants and animals is made available in inorganic (mineral) form. This active process is carried out by bacteria, fungi and other decomposers.*



Dr. Pouyat, standing, assists REU student David Steinberg.

earthworms.

It is hypothesized that all earthworms in areas of North America that were covered by glaciers died during the Pliocene epoch 1.6 - 5 million years ago. Most earthworms in the U.S. Northeast today, then, were introduced by European settlers — in soil used as ballast, for example — over the last few centuries. Human-modified environments, such as agricultural, urban and suburban areas, suited these introduced species well and they flourished.

Earthworms are scavengers: not only do they eat rotting leaves and other plant material, but as they tunnel they eat soil and digest the tiny bits of organic matter that are mixed in with particles of rocks and sand. Their castings contain plant matter mixed with soil, a mixture that assists decomposers in the further breakdown of organic material into its inorganic components. In addition, the worms' sub-surface tunnels increase aeration and drainage of the soil. Can these activities be responsible for the high nitrogen mineralization rates found in the urban soils? If so, then introducing earthworms into rural soils should lead to even higher mineralization rates since the litter quality there is higher.

Mr. Steinberg first determined earthworm density at sites in three areas along the urban-rural gradient: Bronx, N.Y. (urban), Westchester County, N.Y. (suburban), and northwestern Connecticut (rural). He recorded great variation, but in general found a significantly higher number of worms at the urban end of the gradient — up to 51 per square meter, compared to 3 to 4 per square meter at the rural end.

He then attempted to establish experimentally whether earthworms can increase nitrogen mineralization in both urban and rural soils. He used mason jars to create 24 microcosms, filling 12 with urban soil and 12 with rural soil, and adding earthworms to six of each type. He determined that while there was mineralization in all four microcosms, levels in those with earthworms were higher with the greatest response shown in rural soil. These data, coupled with Mr. Steinberg's earlier results on earthworm densities, suggest that earthworm activity is a potential explanation for the disparity between leaf litter quality and nitrogen mineralization rates along the gradient.

High School Student Receives IES Fellowship

This past spring, Ms. Heather S. York was named the first IES Summer Research Fellow under a new Institute program designed to give selected winners at the Dutchess County Regional Science Fair an opportunity to continue doing research. As a junior at Roy C. Ketcham High School in Wappingers Falls, N.Y., Ms. York won the 1993 grand prize at the regional fair with a project on "The Effects of Acidity on Hatching, Development and Survival of Anurans*". Ms. York was also the grand prize winner in 1992 for her study of the effects of salt on seed germination, and that year Institute director Dr. Gene E. Likens presented her with the IES Best Project in Environmental Science and Ecology Award.

With laboratory space, equipment and a stipend provided by the IES fellowship, Ms. York was free to develop her own research project. She became intrigued by the possibility of biological control of the deer tick, the arthropod that transmits Lyme disease. After discussing the idea with IES animal ecologist Dr. Richard S. Ostfeld, who is studying the ecology of the deer tick, and her primary mentor Dr. Josh Van Buskirk, who is developing a computer model for the ecology of Lyme disease, she learned that no one knows why ticks are found on some small mammals in greater numbers than on others. Do ticks have a preference? Why are the greatest numbers of ticks found on the white-footed mouse? Is it possible that the presence or absence of ticks is a function of the mammals' grooming behavior? Ms. York designed a study to answer these questions.

She collected ticks by dragging a square of white cloth through a section of forest; most of the ticks she collected were in the larval stage, common in mid- to late-summer. She then did two experiments. First, using a cage with two chambers, she put a meadow vole on one side and a white-footed mouse on the other. Ten ticks were placed between them, and Tanglefoot® — a sticky material — was spread on the floor of the enclosure. Counting trapped ticks suggested that there was no preference for either of the two mammals; however, a parallel study using an enclosure with one empty chamber showed that at least ticks do recognize the presence of an animal.

Ms. York's second study was designed to learn more about grooming behavior: do

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** Anura is an order in the Class Amphibia that comprises frogs and toads.*



TOM TAFT

Heather York with vole for tick study.

"busy" mice and voles groom less than mice and voles with nothing to do? She put 10 larval ticks on each of two animals, one of which was in a cage equipped with wheel, playing tubes and climbing equipment while the other was in an identical enclosure without toys. She videotaped behavior for an hour during daylight and an hour at night and after 24 hours counted the ticks. When she analyzes her data, she expects to find that mice and voles with less to do groom more, and this may result in a difference in the number of attached ticks. She notes that voles groom more than mice do, with special attention to their ears. The ears of white-footed mice are where most ticks are found.

Ms. York will be completing her data analysis and writing up the project results during her senior year in high school, then looks forward to a career in biomedical engineering or veterinary science.

Calendar

CONTINUING EDUCATION

The final offerings for the fall semester are:

Dec. 18: Holiday Crafts Classes:
Williamsburg Door Decoration
Fresh Holiday Centerpiece

The winter semester begins the week of January 17, 1994. Call the Gifford House at 914/677-5359 for a free catalogue describing classes, workshops and excursions.

SUNDAY ECOLOGY PROGRAMS

Free public programs are held on the first and third Sunday of each month, except over holiday weekends. Programs begin at 2 p.m. at the Gifford House on Route 44A unless otherwise noted. Last-minute schedule changes are sometimes unavoidable, so call 914/677-5359 to confirm the day's topic.

The January - July 1994 schedule has not been finalized, but set aside Sunday, January 16 for the first program of the new year. For information, call the number above.

IES SEMINARS

The Institute's program of scientific seminars features presentations by visiting scientists. These free seminars are held each Friday at 3:30 p.m. in the Plant Science Building. Last-minute schedule changes are sometimes unavoidable, so call 914/677-5343 to confirm the day's topic.

The final seminar for the 1993 season is:

Dec. 10: **Resolving Conflicts Between Needs for Agricultural Production and Climate Protection in the 21st Century**, Dr. Robert Harriss, Univ. of N.H.

The 1994 scientific seminar program begins on Friday, January 14. For information, call the seminar coordinator at 677-5343.

For more information, call the IES Education Program Office at the Gifford House Visitor and Education Center: 914/677-5359 weekdays from 8:30 - 4:30.

GREENHOUSE

The IES greenhouse is a year-round tropical plant paradise as well as a site for controlled environmental research. The greenhouse is open until 4:00 p.m. daily except public holidays. Admission is by free permit from the Gifford House.

GIFT SHOP

Senior Citizens Days: On Wednesdays, senior citizens receive a 10% discount (except sale items).

January "Month-Long Sale": All regularly priced gifts discounted 20%, books discounted 10% and most holiday items discounted 50%.

HOURS

(Winter hours: October 1 - April 30;
closed on public holidays)

Public attractions are open Mon. - Sat., 9 a.m. - 4 p.m.; Sun. 1 - 4 p.m.; trails and roadways are closed during the deer hunt.

The **Gift and Plant Shop** is open Mon.- Sat., 11 a.m. - 4 p.m. and Sun. 1 - 4 p.m.

(Closed weekdays from 1 - 1:30 p.m.)

Christmas and New Years: Closed Friday & Saturday Dec. 24 & 25, and Dec. 31 & Jan. 1; open during regular hours on Sunday Dec. 26 and Jan. 2.

• *All visitors must pick up a free permit at the Gifford House Visitor and Education Center on Route 44A for access to IES public attractions. Permits are available until 3:00 p.m. daily.*

MEMBERSHIP

Become a member of the Institute of Ecosystem Studies. Benefits include a member's rate for IES courses and excursions, a 10% discount on Gift Shop purchases, a free subscription to the IES Newsletter, and participation in a reciprocal admissions program, with benefits at over 100 nature centers, forest preserves, gardens and conservatories in the U.S. and Canada. Individual membership is \$30; family membership is \$40. For information on memberships, call Janice Claiborne at 914/677-5343.

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